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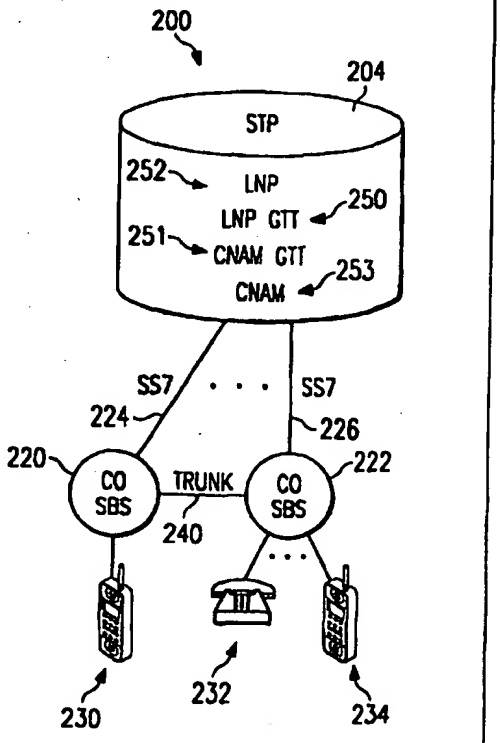
(57) Abstract

A system and method for number portability processing at a signal transfer point (204) are provided. The signal transfer point (204) includes additional processors (328, 358) and databases (332) for processing routing and service queries. A query message is received by the signal transfer point (204), a first database residing in the signal transfer point (204) is accessed to determine the location of a second database (332) also residing in the signal transfer point for processing the query message. The second database (332) is then accessed to obtain the requested information, which is delivered to the query originator, such as a central office (220, 222).



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SYSTEM AND METHOD FOR NUMBER PORTABILITY PROCESSING IN A TELECOMMUNICATIONS NETWORK

TECHNICAL FIELD OF THE INVENTION

This invention is related in general to the field of telecommunications systems. More particularly, the invention is related to a system and method for number portability processing in a telecommunications network.

BACKGROUND OF THE INVENTION

The network evolution as a result of the recent telecommunications bill has enhanced competition for local phone service. This increased competition has introduced the need for number portability.

Number portability allows a subscriber to change service provider, service, or geographic location while keeping their phone number. New number portability procedures are needed to determine how to route a call to a subscriber who has ported their number. These procedures force changes in existing network implementations. Current telecommunications network service providers and new and upcoming providers must standardize the exchange of routing information for proper call delivery and to support internetwork services.

In this new environment, a signalling system no. 7 (SS7) query message is often needed for call setup to a portable number and for certain enhanced services. For

routing a call in an area of number portability, a query to a number portability database may be required. For services such as line information database (LIDB) services, switch based services (SBS) such as certain Bellcore's CLASS® services, calling name (CNAM) delivery, and interswitch voice messaging (ISVM), a signalling procedure called global title translation (GTT) is needed. The global title translation procedure performed for these query messages provides the necessary routing information to deliver the query to the proper database.

The signal transfer point (STP) was used to perform these global title translations. The end application, which may be a service control point (SCP) or a central office (CO), is addressed as a result of a final global title translation, resulting in the delivery of the query to the appropriate database. In a telecommunications network, a service control point is typically coupled to the signal transfer point by an SS7 link set having a capacity limit of sixteen 56 Kb/s links. The signal transfer point is, in turn, coupled to a plurality of central office (CO) switching systems, which are connected to the telephone customers. When a telephone customer places a call, a query may be required to route the call. Additional queries may be required to perform services associated with the call. The query is sent from a central office switching system to a designated STP where a global title translation is performed. The result of the translation procedure is SS7 routing information used to deliver the query to the proper network element. A response message is then sent back to the originator of the query.

Due to the entry of many new service providers into the local telephone service arena, there is an increasing need for a number portability database used to obtain

routing information needed to route the call to the correct service provider's network.

Due to the anticipated large query volume in a number portability environment, the link set between service control point and signal transfer point becomes a troublesome bottleneck, creating a potentially substantial negative impact to the network's ability to route calls and provide services.

Number portability also causes a significant increase in the GTT databases used to support services. GTT databases in the past may route based on an office code since all phone numbers of the office code belonged to the same central office. An office code is the first six digits of a telephone number. For services in a number portability environment, an office code is insufficient. Ten digits are needed for global title translation processing since phone numbers may be ported out of an office. To meet the need of ten digit global title translation, the number of entries in the GTT databases requires significant expansion.

SUMMARY OF THE INVENTION

Accordingly, a need has arisen for a solution to the congestion problem existing in the SS7 link sets coupling the SCPs and STPs. The teachings of the present invention provides a system and method for number portability processing which addresses this problem.

In one aspect of the invention, a method for number portability processing includes the steps of receiving a query message by a signal transfer point, which requests information related to a specific telecommunications customer from a query originator, and looking up in a first database residing in the signal transfer point to determine the location of a second database residing in the signal

transfer point for processing the query message. The second database is then accessed to obtain the requested information, which is delivered to the query originator.

In another aspect of the invention, a system for number portability processing in a telecommunications network provides a first cluster of processors adapted for receiving a query message requesting for information related to a specific telecommunications customer from a query originator, and a first database being accessible by the first cluster of processors and having location information of a second database. The system further includes a second cluster of processors co-located with the first cluster of processors and being adapted for receiving the query message from the first cluster of processors, and a second database being accessible by the second cluster of processor and having the requested information. The second cluster of processors is adapted for obtaining the requested information from the second database and forwarding the requested information to the first cluster of processors for further processing.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference may be made to the accompanying drawings, in which:

FIGURE 1 is a simplified block diagram of a portion of an exemplary telecommunications network;

FIGURE 2 is a simplified block diagram of a portion of an exemplary telecommunications network according to the teachings of the present invention;

FIGURE 3 is a simplified block diagram of an exemplary signal transfer point with vertical application subsystem according to the teachings of the present invention; and

FIGURE 4 is a simplified process flow diagram of global title translation according to the teachings of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiment(s) of the present invention is (are) illustrated in FIGURES 1-4, like reference numerals being used to refer to like and corresponding parts of the various drawings.

FIGURE 1 illustrates the telecommunications industry's current architecture 100 for call delivery and services. Service control point (SCP) 102 is coupled to a signal transfer point (STP) 104 through a signalling system no. 7 (SS7) link set 106. An SS7 link set may include up to sixteen 56 Kb/s links. STP 104 is in turn coupled to one or more central offices (COs) 120 and 122 via SS7 link sets 124 and 126. Central offices 120 and 122 connect telephone service customers 130, 132, and 134 to the telecommunications network. It may be seen that SS7 link set 106 between SCP 102 and STP 104 becomes a bottleneck for transporting database queries originating from multiple central offices 120 and 122. As such, SS7 link set 106 severely restricts the SCP's ability to service large volumes of telephone calls.

SCP 102 provides centralized database functions including a local number portability (LNP) database 150, a line information database (LIDB) 151, and a calling name (CNAM) database 152. STP 104 includes global title translation (GTT) databases such as an LNP GTT 154, an LIDB GTT 156, switch based services GTT 158, CNAM GTT 160, and interswitch voice messaging (ISVM) GTT 162 databases containing routing data related to each service.

In Figure 1, both central offices 120 and 122 are within a common area of number portability and both offices

contain portable numbers. In this example, customer 132 has ported to central office 122. When customer 130 calls customer 132, central office 120 must do a query to SCP 102 to obtain the necessary routing information. This process first consists of performing a global title translation at STP 104. To do this, central office 120 sends the message to STP 104 via link set 124. STP 104, upon receiving the query message, performs the global title translation procedure using LNP GTT database 154 which results in the routing address of SCP 102. STP 104 then routes the query message to SCP 102 via link set 106. SCP 102 then performs a LNP database 150 lookup and returns the requested routing information in a response message to central office 120 via link set 106, STP 104, and link set 124. Central office 120 then uses the returned information to route the call over trunk 140.

Continuing with this example, another query is required if the called or calling party has subscribed to a service. To support a service, a global title translation and an information retrieval such as a database lookup is often required. For purposes of teaching the present invention, an example of calling name delivery will be used. In this example, the central office needs to query SCP 102 to obtain the needed name information. The query is first sent by central office 122 to STP 104 via link set 126. STP 104, upon receiving the query message, performs the global title translation procedure using CNAM GTT database 160 which results in the routing address of SCP 102. STP 104 then routes the query message to SCP 102 via link set 106. SCP 102 then performs a CNAM database 152 lookup and returns the requested routing information in a response message to central office 122 via link set 106, STP 104, and link set 126. Central office 122 uses the returned service information to deliver the name

information to customer 132. As can be seen, this process again requires bandwidth from the limited capacity link set 106.

Referring to FIGURE 2, a relevant portion 200 of a telecommunications network is shown. Telephone service customers 230, 232, and 234 are coupled to central offices 220 and 222. Signal transfer point 204 is in turn coupled to one or more central offices 220 and 222 via SS7 link sets 224 and 226. STP 204 may include GTT databases such as LNP GTT 250 and CNAM GTT 251, as well as LNP 252 and CNAM 253 databases that were resident in the SCP previously. Note that references to specific databases herein are merely exemplary and that other databases may also be located on STP 204 to perform global title translation and call delivery services.

In FIGURE 2, both central offices 220 and 222 are within a common number portability area and both central offices contain portable numbers. In this example, customer 232 has ported to central office 222. When customer 230 calls customer 232, central office 220 sends a query to obtain the necessary routing information to determine the location of customer 232. This process first performs a global title translation at STP 204, by sending the message from central office 220 to STP 204 via link set 224. STP 204, upon receiving the query message, performs the global title translation procedure using LNP GTT database 250. The global title translation procedure in this example results in the routing address of STP 204. STP 204 identifies that the message is destined to itself. STP 204 then proceeds, under the teachings of this invention, to send the message to STP-resident LNP database 252. STP 204 performs an LNP database 252 lookup and returns the requested routing information in a response message to central office 220 via link set 224. Central

office 220 then uses the returned information to route the call over trunk 240. As may be seen, both database lookup steps were done at STP 204. No query to a remote database was needed for number portability, thus eliminating the need for a separate SCP and the links to a remote SCP.

Continuing with this example, another query is required if the called or calling party has subscribed to a service. To support the service, an additional global title translation and an information retrieval such as a database lookup is required. For purposes of teaching this present invention, the example of calling name delivery service is used. In this example, the central office needs to obtain the required name information. To do this, a query is first sent by central office 222 to STP 204 via link set 226. STP 204, upon receiving the query message, performs the global title translation procedure using CNAM GTT database 251 which results in the routing address of STP 204. STP 204 then performs a resident CNAM database 253 lookup and returns the requested service information in a response message to central office 222 via link set 226. Central office 222 uses the returned service information to deliver the name information to customer 232. As can be seen, global title translation procedures and database lookups are both done at STP 204. No query to a remote database was needed for the service thus eliminating the need for a separate SCP and the links to that SCP.

Referring to FIGURE 3, a more detailed block diagram of an STP 300 with added database and processing units is shown. STP 300 includes a message transport network (MTN) backbone 301 which provides communication between clusters of processors. One cluster of processors 302 may perform administration, maintenance, and communication functions for the system. Another cluster 304 represents one or more SS7 clusters which process SS7 signalling messages that are

transmitted on SS7 link sets. SS7 cluster 304 includes a transport node controller (TNC) 306 coupled to common channel distributors (CCDs) 308 and common channel links (CCLKs) 310 via a network 312.

Either of two hardware additions may be used on STP 300. The first addition to STP 300 is a vertical application subsystem (VAS) cluster 320, which includes a transport node controller 322 coupled between message transport network 301 and a predetermined number of ethernet controllers (ENCs) 324. Ethernet controllers 324 are coupled to transport node controller 322 via a computer network 326 and to a predetermined number of vertical application subsystems (VAS) 328 via another ethernet network 330. Each vertical application subsystem 328 preferably includes fault tolerant multiprocessor engines with built-in redundancy. Data storage devices 332 are further coupled to vertical application subsystems 328. Vertical application subsystems 328 may include redundant platform managers and a plurality of application processors with one or more back-up spare processors that can take up the load of failing or failed application processors.

Alternatively, a plurality of redundant vertical application subsystem processor pairs 358 may be added to provide GTT database and service database capabilities. These processors are coupled to a transport node controller 344 via an internal bus structure 346. Each processor pair 358 provides a query and global title translation processing transaction rate dependent on software design and processor speed. The number of processor pairs may be increased as needed to meet query and global title translation processing transaction demands. Additional bus structures 346 and associated transport node controllers 344 can also be added if offered load to an individual bus structure approaches or reaches capacity.

Referring to FIGURE 4, a signalling connection control point (SCCP) query message arrives from a central office to a common channel distributor 308 via a common channel link 310 (FIGURE 3). Data within the query message is used to look up in a translation type (TT) table 402 to determine which database table to use and where the database resides. Translation type table 402 yields a GTT database location (LOC), which specifies the location of the database that contains the data required to process the call. The location may be common channel distributor 308 or vertical application subsystem 328 or 358. The data, according to the type of call, is then obtained from the appropriate database or table 250-263 and processing of the query message is then completed in common channel distributor 308. A response is then sent back to the central office, which then routes the call onto the proper trunk or provides the appropriate service response. It may be seen that the GTT databases may be located in any processor or processor pairs in STP 300.

It may be understood from the foregoing that any application that uses common channel signalling messages may be ported from databases residing in the SCPs to the STPs. Instead of forwarding query messages to the SCP, the STP is capable of processing the requests. In this manner, the bottleneck that exists in the SS7 link set between the SCP and the STP is eliminated. Therefore, the query response time is significantly less than that found in conventional telecommunications networks. Further, as query volume increases, conventional networks are forced to add SCPs due to the limitation of the 16 SS7 links per link set between the STPs and SCPs. The present invention eliminates the need to add new SCPs by performing global title translation and SCP query processing at the STP which has broader connectivity to query originators.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A method for number portability processing, comprising the steps of:

at a signal transfer point, receiving a query message requesting for information related to a specific telecommunications customer from a query originator;

looking up in a first database residing in the signal transfer point and determining a location of a second database residing in the signal transfer point for processing the query message;

looking up in the second database residing in the signal transfer point and obtaining the requested information; and

delivering the requested information to the query originator.

2. The method, as set forth in claim 1, wherein the query message receiving step comprises the step of receiving a query message requesting for routing information.

3. The method, as set forth in claim 1, wherein the query message receiving step comprises the step of receiving a query message requesting for service information.

4. The method, as set forth in claim 1, wherein the first database lookup step comprises the step of looking up in a global title translation database for the location of the second database.

5. The method, as set forth in claim 1, wherein the first database lookup step further comprises the step of looking up in a global title translation database for a location of a processor residing in the signal transfer point having access to the second database.

6. The method, as set forth in claim 5, further comprising the step of routing the query message to the processor in response to the location obtained from the global title translation database.

7. The method, as set forth in claim 1, further comprising the step of looking up in one or more additional databases residing in the signal transfer point for routing information and/or the requested information.

8. A system for number portability processing in a telecommunications network, comprising:

a first cluster of processors adapted for receiving a query message requesting for information related to a specific telecommunications customer from a query originator;

a first database being accessible by the first cluster of processors and having location information of a second database;

a second cluster of processors co-located with the first cluster of processors and being adapted for receiving the query message from the first cluster of processors; and

a second database being accessible by the second cluster of processor and having the requested information, the second cluster of processors obtaining the requested information from the second database and forwarding the requested information to the first cluster of processors.

9. The system, as set forth in claim 8, wherein the first and second cluster of processors and the first and second databases reside in a signal transfer point.

10. The system, as set forth in claim 1, further comprising a message transport network coupled to the first and second clusters of processors and adapted for routing messages therebetween.

11. The system, as set forth in claim 1, wherein the second cluster of processors comprises pairs of processors.

12. The system, as set forth in claim 11, wherein one of the pairs of processors is a backup processor of the other processor.

13. The system, as set forth in claim 1, wherein the second cluster processors are coupled to one another via a network.

14. A method for number portability processing by a signal transfer point, comprising the steps of:

at the signal transfer point, receiving a query message requesting for routing/service information related to a specific telecommunications customer from a query originator;

looking up in a global title translation database residing in the signal transfer point and determining a location of a routing/service database residing in the signal transfer point for processing the query message;

looking up in the routing/service database and obtaining the requested information; and

delivering the requested information to the query originator.

15. The method, as set forth in claim 14, wherein the global title translation database lookup step further comprises the step of looking up in a global title translation database for a location of a processor residing in the signal transfer point having access to the routing/service database.

16. The method, as set forth in claim 15, further comprising the step of routing the query message to the processor in response to the location obtained from the global title translation database.

17. The method, as set forth in claim 14, further comprising the step of looking up in one or more additional databases residing in the signal transfer point for routing information and/or the requested information.

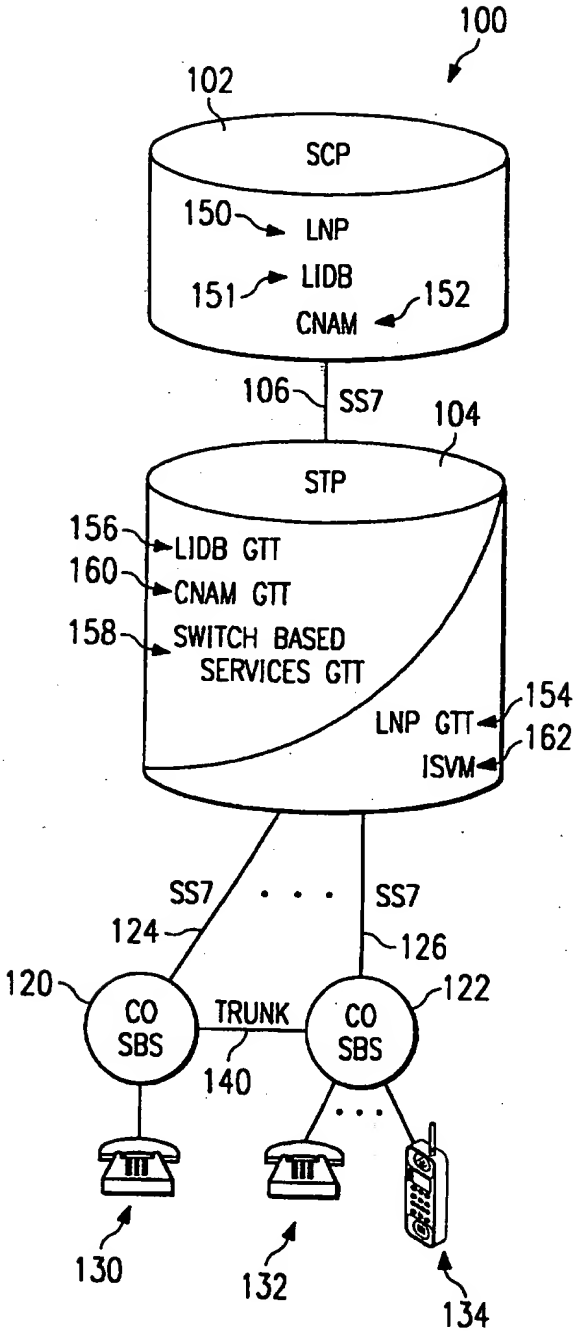
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FIG. 1

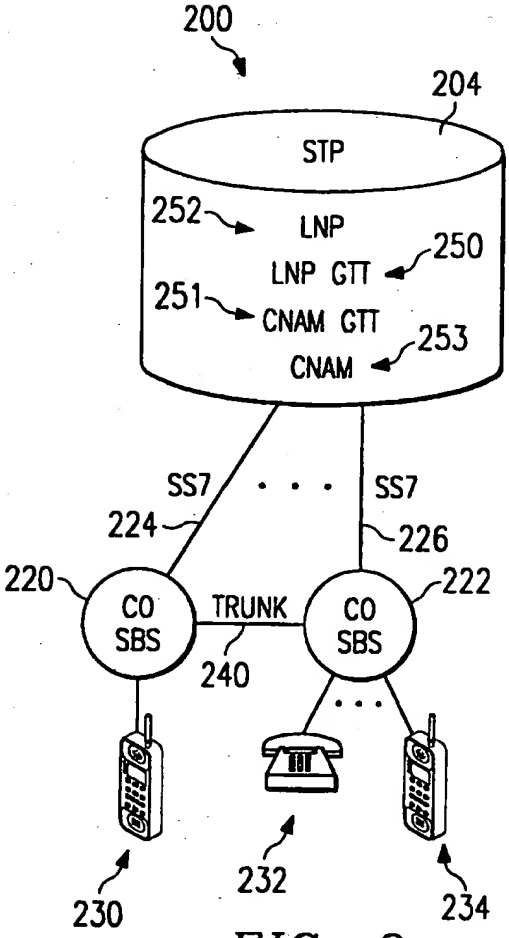
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FIG. 2

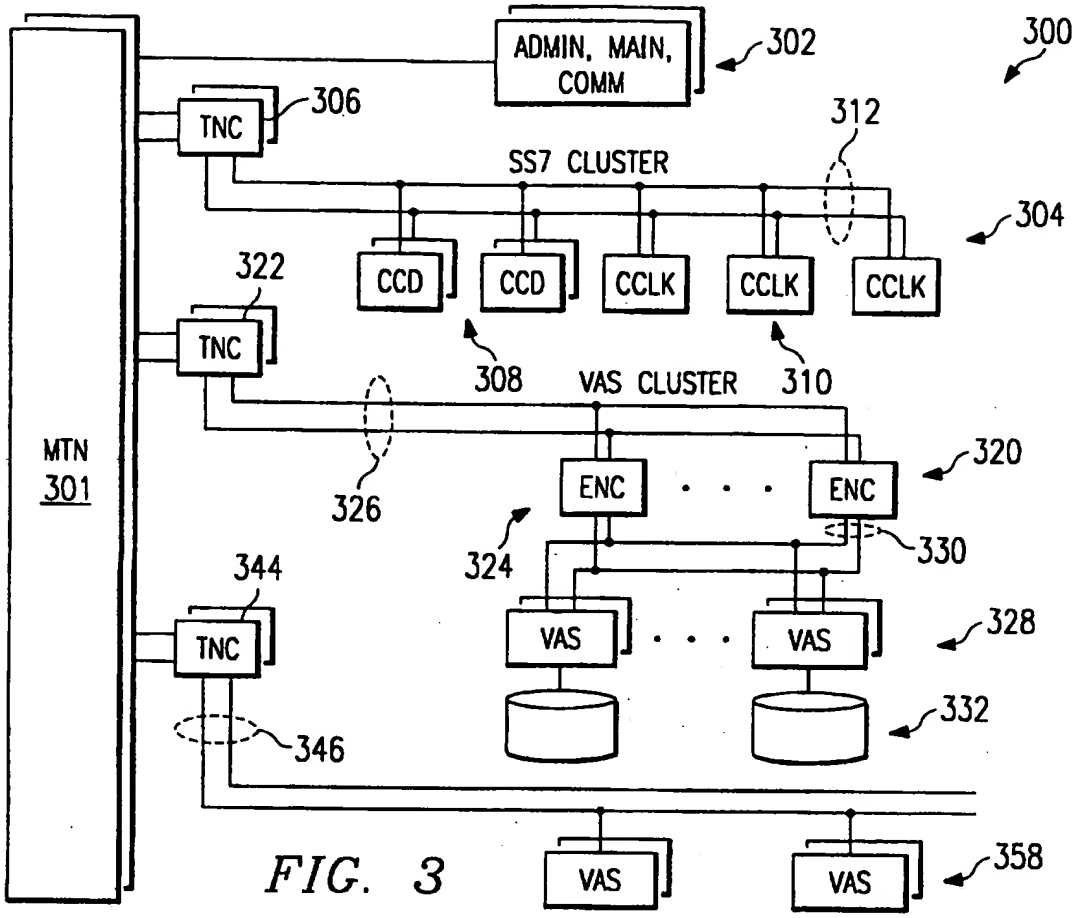
ADMIN, MAIN, COMM
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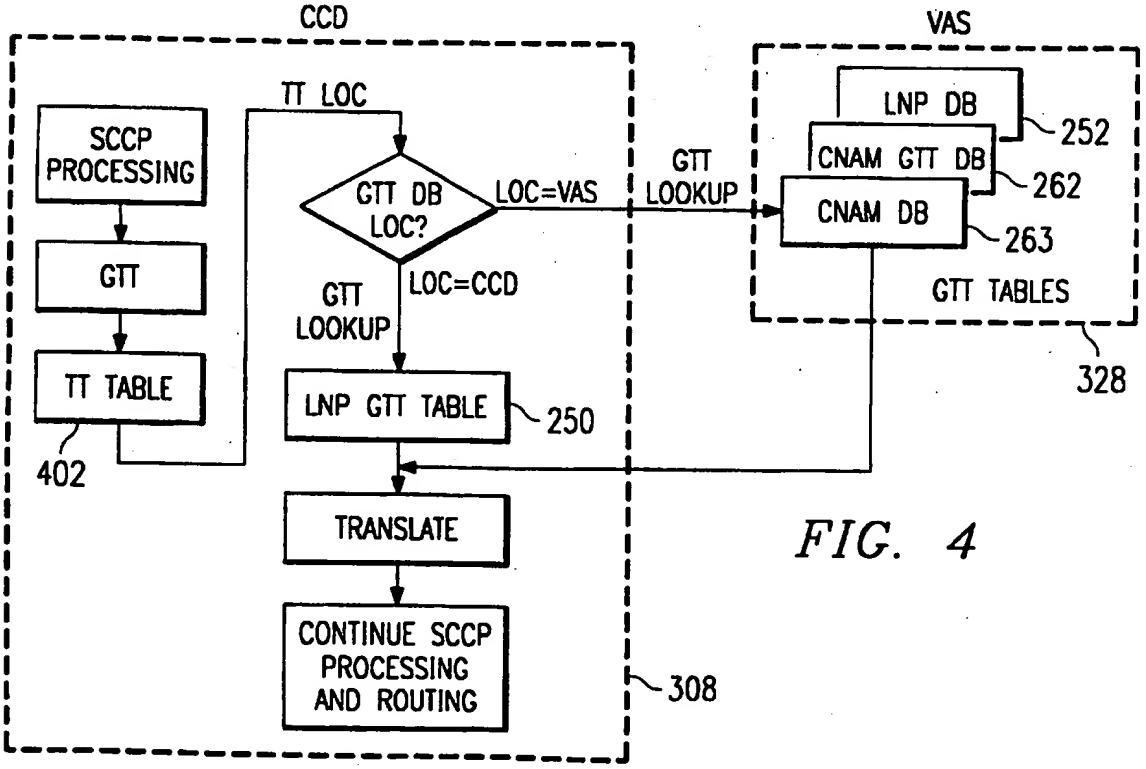
FIG. 3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402
TRANSLATE
CONTINUE SCCP PROCESSING AND ROUTING
308

FIG. 4